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Man's Age in the World.

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OF THE

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IN CONNECTION WITH HARVARD UNIVERSITY.

PRESENTED BY

Hon. A. W. W. Stuart

Sept 27. 1878.

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OPENING of the LEWIS BROOKS MUSEUM

AT THE
UNIVERSITY OF VIRGINIA,

JUNE 27th, 1878.

ADDRESS

ON

MAN'S AGE IN THE WORLD.

BY

JAS. C SOUTHALL, A. M., LL. D.,

WITH INTRODUCTORY REMARKS OF

Hon. A. H. H. STUART, Rector.

Richmond:

PRINTED BY ORDER OF THE BOARD OF VISITORS.

1878.

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Rec. Sept. 27, 1878.

CLEMMITT & JONES,
PRINTERS,
RICHMOND, VA.

RESOLUTIONS OF THE BOARD OF VISITORS,

PASSED JUNE 27, 1878.

WHEREAS this board desires to preserve in a permanent shape some record of the public opening of the Brooks' Museum, both in grateful appreciation of the munificence of Mr. Brooks, and to give enduring form to the addresses delivered on the occasion: Therefore,

Resolved, 1. That we hereby request of Hon. A. H. H. Stuart and Dr. J. C. Southall copies of the addresses delivered by them this day.

Resolved, 2. That the Executive Committee cause to be printed one thousand copies of said addresses, with such other matter as they may judge suitable, of which two hundred copies shall be bound.

Resolved, 3. That ten copies of said publication so bound shall be deposited in the University Library, and the others disposed of as the Executive Committee may deem best.

Resolved, 4. That the Executive Committee be authorized to draw on the Proctor for cost of publication.

Resolved, 5. That Mr. Hart be requested to ask of Dr. Southall a copy of his address.

PREFATORY NOTE.

Early in 1876, Professor HENRY A. WARD, of Rochester, New York, in correspondence with Professor SMITH, of the University of Virginia, announced to him that a gentleman of Rochester, an admirer of Mr. Jefferson, and an earnest well-wisher of the South, who directed that his name should be withheld, desired to promote the study of Natural History in the University by the establishment of a complete and costly Museum on the condition that other friends of the institution would raise the sum of \$12,000 to provide for the necessary cases, mounting, transportation, &c.

The Board of Trustees of the Miller Agricultural Department of the University promptly pledged \$10,000 of the required amount, and Professor W. B. Rogers and other alumni furnished the remaining \$2,000 of the required sum. This having been secured, the following letter was addressed to the Hon. A. H. H. Stuart, Rector of the University, by the still unknown benefactor, under the bonds of secrecy:

ROCHESTER, April 14th, 1876.

To the Rector and Visitors of the University of Virginia:

GENTLEMEN:—Prof. Henry N. Ward, of this city, will deliver to you herewith forty-five of the bonds of the Chicago, Burlington, and Quincy Railroad Company, of one thousand dollars each—\$45,000.

This sum being deemed by Prof. Ward sufficient to enable you to provide a suitable Building for a Cabinet of Natural Science (with the exception of Botany) and to procure through him, on terms which will be mutually satisfactory, the necessary material for such Cabinet, which in extent and in all

respects will be well adapted to the purpose of instruction in this department of education in the University of Virginia, I respectfully tender for your acceptance the Bonds above-mentioned; the avails of twenty-five of them to be devoted to the procurement of the material for said Cabinet, the remaining twenty to the erection of a suitable building.

I am, gentlemen,

Very respectfully yours,

LEWIS BROOKS.

The proceeds of the bonds mentioned in this letter amounted to \$50,000. To this sum Mr. Brooks subsequently added nearly \$20,000 for the extension of the building and of the collection, authorizing among other things the addition of a Botanical Hall. The building was completed in July, 1877, and before the splendid collection of specimens which now fills its wide halls and well-planned galleries had been fully arranged and placed in position, the telegraph announced the name and sudden death, on the evening of the 9th of August, 1877, of Virginia's wise and noble benefactor. His heirs, in order to carry out fully his plan for the Museum, have generously offered to complete the collection by adding the specimens for the Botanical Hall. The Museum has attracted much attention, and stands on the site selected by its founder—a splendid addition to the educational forces of the University of Virginia, and a lasting monument to the memory of LEWIS BROOKS.

ADDRESS OF HON. A. H. H. STUART.

LADIES AND GENTLEMEN:

The occasion which has brought us together to-day must be recognized by all who are present, as one of extraordinary interest, and, I doubt not, it will be so regarded by generations which are to come after us. We have met to commemorate, by suitable ceremonials, the formal opening and dedication of the "LEWIS BROOKS MUSEUM OF NATURAL SCIENCE;" and to render honor to the memory of its munificent founder.

Aside from the mere fact of the noble contribution to the cause of science which has been made by him, there are considerations, connected with the time and circumstances under which his benefaction was bestowed, which demand that they should not only be gratefully acknowledged by us, but that they should be transmitted, in a form more enduring than granite or marble, to future generations.

Shortly after the close of the recent civil war, which was so well calculated to awaken and call into action the worst passions of our nature; and when, in fact, the two great sections of our country were inflamed and exasperated against each other by all the angry feelings and prejudices engendered by the then recent fierce sectional conflict, the extraordinary spectacle was presented to the public, of an old gentleman, of one of the northern states,—venerable alike for his age and private virtues—a man, theretofore unheralded by fame,—and whose name even was un-

known to the people of Virginia—rising above the infirmities of human nature, and animated by that spirit of Christian charity “which is not easily provoked, and thinketh no evil,” becoming the generous founder, at the oldest university of the Southern States, of the splendid Museum, which we are now about to dedicate to its appropriate uses.

His singular modesty and disinterestedness in this act of beneficence is evinced by the fact that he refused constantly, as long as he lived, to allow his name to be made known even to the Visitors and Faculty of the University on which he had conferred so great a favor, and until his death, a few months ago, the Rector of the University was the sole depository of his secret.

There is much in this magnanimous act, and in the circumstances under which it was done, which tend to stamp it with the impress of moral sublimity.

It has been the custom of men in all ages to commemorate lofty deeds of their fellow-men by suitable monuments, intended to transmit them to the remotest posterity. This seems to us to be one of the deeds which deserves to be thus perpetuated.

Fortunately, there is no need that we should erect any monument of bronze or marble, to hand down to future ages, the name of “LEWIS BROOKS.” The Museum itself stands, and, I hope, will forever stand,—a noble *material monument* of his munificent contribution to the cause of science.

But there are other memorials which are more durable than brass or monumental marble.

The ruins of Babylon, of Baalbec, and of Palmyra, teach us that the proudest structures erected by human hands, must soon crumble beneath the touch of time’s effacing finger; while the creations of the human intellect, like the works of Homer, Thucydides, and Aristotle, are destined to continue indestructible, through all future ages.

It was, therefore, wisely determined by the authorities of the University to perpetuate the memory of our munificent benefactor, by inscribing his name, in letters of living light, on the archives of the institution, and by associating it inseparably with a noble intellectual contribution to the store of human knowledge.

In casting about for an architect competent to plan and erect this *intellectual monument*, more stately than the proudest column, and more durable than the pyramids of Egypt, it was readily perceived that he should be a native of Virginia, intimately acquainted with Virginian character, and deeply imbued with Virginian feeling, so that he might give suitable expression to the sentiment of Virginia. It was proper, in the next place, that he should be an *alumnus* of the University, with a heart filled with filial love to his *alma mater*, and a mind trained to letters, and scientific investigation, by her admirable system of intellectual culture. Finally, it was necessary that he should be a man of vigorous intellect, of catholic sentiment, of ripe scholarship, and known to the world as being in full sympathy with the cause of science and human progress.

I grant that it was a difficult task to find a man in whom all these high qualifications were harmoniously blended. But all will admit that the authorities of the University have been fortunate in securing the services of a gentleman eminently qualified for this high and responsible duty, when I introduce to you, as the orator of the day, Mr. JAMES COCKE SOUTHALL, of Virginia.

MAN'S AGE IN THE WORLD:

AN ADDRESS DELIVERED AT THE REQUEST OF THE FACULTY OF THE UNIVERSITY OF VIRGINIA, ON THE OCCASION OF THE OPENING OF THE LEWIS BROOKS MUSEUM OF NATURAL SCIENCE, JUNE 27TH, 1878, BY JAMES C. SOUTHALL, A. M., LL. D.

Mr. Rector and Gentlemen of the Board of Visitors :
Mr. Chairman and Gentlemen of the Faculty :
Ladies and Gentlemen :

We have assembled here, and I have been requested to deliver this address, in connection with the formal opening of the Lewis Brooks Museum of Natural Science. By the munificence of a stranger who lived and died in a distant State, aided from the endowment bestowed by a large-hearted Virginian, we have placed another jewel in the diadem of our *Alma Mater*, and I am bold to say have marked a new era in the history of the University. Breaking through the ties of sectional prejudice and provincial sentiment, and recognizing in this institution the presence of that immortal spirit who was the broadest and most far-seeing of all the American statesmen, our benefactor has erected here one of those imperishable monuments, which, in comparison with the cold and pulseless marble, is like some beautiful fountain, sleeping and breathing in the silent rock, and sending forth forever its pure and unsullied crystal waters. Oftentimes, men of generous and liberal ideas, misplace the subjects of their bounty; the gift is often unsuitable or incapable of utilization,

and large sums of money are wasted and thrown away, because misdirected towards the general object in view. By a happy inspiration Mr. Brooks, if I may borrow a phrase from the distinguished professor of Moral Philosophy, seems to have "intuited" the need of our University; it was precisely such a museum as this that we wanted right here, to draw the attention of our young men to the most engrossing study that now engages the devotees of science, and to equip our noble institution in some sort for that field of investigation which has grown of late into such importance.

We could very well dispense with a gallery of pictures, or a School of Design, although I do hope that Drawing will hereafter receive that attention in our male and female schools which it so richly deserves; nor are we prepared for a chair of Sanskrit or Oriental Literature; nor for Egyptology or the Chinese Language and Literature; nor have we any imperative need for a Museum of Archæology; we can even wait, if our noble friend will favor us, for our great telescope, which we hope to see crowning at no distant day one of the neighboring eminences; but that the young men of Virginia and the South should enter upon the study of Geology and Zoology, in the present state of science, hardly admits of further delay, and in receiving the specimens which have been collected and arranged in yonder Museum, headed by that portentous effigy* which is the most conspicuous object in the several halls, I am sure you will agree with me, Mr. Rector and gentlemen, that we have no elephant on our hands!

That elephant is one of the most interesting objects now in the domain of science. If we can fix the Mammoth's "place in nature"—to use the words of the gifted Huxley—we can fix that of man; and I am glad that the young gentlemen here, in the

* The Mammoth.

presence of this Colossus, have ever before them a mute, yet persuasive, invocation into the path of Anthropological study.

The invitation to deliver this address was accompanied by the request that I should select for the occasion a topic which I have made a special subject of investigation for some years, and I shall therefore, as far as it can be done in a brief hour's time, attempt to lay before you the present phase of the question of "Man's Age in the World."

It is alleged, as you are aware, gentlemen,—monstrous as it appears to the unscientific and those who have not paused to reflect on the subject—that, surrounded as we are in that Museum by all those Rhizopods, Euripterids, Selachians, Saurian and Simian forms, we stand there in the presence of our ancestors:—a grotesque and ill-favoured procession of progenitors! It seems to me, therefore, eminently appropriate, in these inauguration ceremonies, that we should undertake to fix with some little exactness the precise relations which are to exist between the old residents here and the new intruders in these classic shades. I think it will be well to disabuse our minds of any suspicion of relationship—say between the Professor of History and the *Rhamphorhyncus Bucklandi*—or the Mathematical Professor and the *Inoceramus rectangulus*, that pioneer geometer of the Jurassic seas—if in fact no such link exists; and on the other hand, if that *Cynocephalus hamadryas* or that *Macacus silenus* is your great-great-great (to the n^{th} power) grandfather—or to speak more accurately, a very distant cousin, descended from the same *stirps*—I think a knowledge of that fact would lead you to look with deeper interest, when you enter that room, on his portrait.

Evolution is now the doctrine of a large majority of the scientific men of Europe and America. It has proceeded so far that you will find it (as also the doctrine of the Antiquity of Man)

incorporated in our advanced text-books of Geology, like Lyell's and Page's and LeConte's. Whatever opinion one may hold on the subject, I cannot but regard this introduction of it into a text-book as a grave infraction of the governing principle of all true science, and a most dangerous departure from that rigid scientific method which is the true glory of science. Science is positive knowledge; the true scientific spirit is characterized by a caution that almost exceeds that of a conveyancer. No proposition is admitted into the scheme which has not passed the most rigid scrutiny, and been found to be—so far as anything human is sure—absolutely certain and unassailable. On the portals of its Temple is written, "No hypothesis enters here."

While, therefore, it is perfectly legitimate to frame conjectures as to the origin of life, or the appearance of new forms of life, it is an unwarrantable abandonment of the fundamental law of science to propound any statement on this subject as an ascertained fact which the propounder does not know to be true. We do not quarrel with Pythagoras for his doctrine of the harmony of the spheres, for he lived in an uncritical age, and did not claim to found his philosophy on observation; nor do we quarrel with the elemental substances of Empedocles, or with the atoms of Leucippus and Gassendi; or with the ideas and the mathematical forms of Plato; or with the monads of Bruno and Leibnitz; and we smile at Burnet's *Sacred Theory of the Earth*, and Semmes's vagaries about the North Pole; because these were avowedly guesses at truth, and Physical Science in the true sense (as regards most of the instances cited) did not then exist. But if any physicist in these days should gravely teach that the elementary substance of all things is ascertained to consist of spherical monads or metaphysical points; or that water proceeds from elements having the icosahedral form, fire from elements of the pyramidal form, earth from elements of the cubical form, and

that the form of the universe is related to the dodecahedron; or that fire and the soul consist of fine, smooth, round atoms, and that the worlds have been generated by the rotatory motion in space of myriads of fortuitous atoms of different weights; would any one in such a case challenge our right to call a halt in the name of Science, and ask for what I believe in legal phrase is styled a bill of particulars?

Now while it is by no means the absurd theory which it is popularly thought to be; while it is largely supported by the analogies of nature; no conscientious advocate of Evolution will say that it is more than a *belief*: not one solitary case has been made out. There is not an animal living, or an animal form in the geological strata, whose pedigree has ever been positively carried across the barrier of species.

I have not the slightest idea, however, of discussing on this occasion the doctrine of Evolution; it would extend my remarks far too much to go into that subject. As bearing, nevertheless, on my main theme, the Appearance of Man on the Earth, I am compelled to touch the subject in a very general way. If Man was developed from the lower animals, his age, of course, is inconceivable. In that case we should have to trace man back through a long line of ancestors until, somewhere in the Tertiary strata, we reached the common trunk from which the anthropoid and pithecoïd types bifurcated. No such forms have, however, been found, earlier than the close of the Quaternary, and the human skeletons of this date—the oldest human skeletons—are precisely like the human skeletons of to-day, with the same general frame and the same cerebral capacity. Nor have any human implements been found in the Tertiary strata. Certain incised bones were found some ten years ago in the Pliocene strata of France, at St. Prest, and similarly marked bones were found about the same time in the Val d'Arno, in Italy, by Prof.

Ramorino; and it was claimed that they had been cut by human hands. The distinguished Professor Lesley of Pennsylvania was misled by the discovery, and prematurely announced in a public lecture in Boston that Tertiary man had at last been found. Lyell, however, afterwards ascertained that precisely similar striæ and cuttings are made by the porcupine, and as the remains of the *Trogontherium*, a great extinct rodent, were found at St. Prest, in the same beds with the incised bones, it was naturally concluded that this animal, and not man, had left the marks which seemed so full of interest to Prof. Lesley. The Abbé Bourgeois in France also claims to have found worked flints in a Miocene bed at Thenay, but his conclusions are not accepted by any careful geologist, and in fact would prove too much, as on the Evolution theory man could not by this time have developed sufficiently to manufacture stone implements.

Prof. O. C. Marsh of Yale, and Prof. Whitney of California, have also been misled, and have spoken unadvisedly with regard to the discovery of traces of man in the Pliocene of California; and Prof. Le Conte, in his recent elaborate and valuable "Elements of Geology," has given some countenance to this mistake.*

In this case too the evidence proves too much, as the human implements found, at the depth of 200 feet, under the lava deposits of California, in the auriferous gravel, consist of superb granite mortars and dishes, of large size, and beautiful weapons and tools belonging to the Polished Stone Age (if not, rather, that of the metals); and it must only excite a smile to suppose that man was a skilled artisan in granite in the Tertiary Age. The objects found in the gold-bearing beds of California were doubtless left there, as I have shown elsewhere, by the ancient

* Prof. Marsh's Address before the American Association in 1877; Foster's Prehist. Races of United States, p. 53; Le Conte's Elements of Geology, p. 567.

inhabitants of this region, who sank deep shafts and ran long galleries in the mountains in their search for gold.

Mr. Bancroft, in his "Native Races of the Pacific States," has collected a number of instances in which these mortars have been met with, and "they have been found," he tells us, "in almost every instance by miners in their search for gold;" and they come in almost every instance from the "auriferous gravel."*

The abundance of the precious metals we know excited the astonishment and the cupidity of the Spaniards in both Mexico and Peru, and both gold and copper, we are told by Mr. Bancroft, were mined in ancient times in Mexico from veins in the solid rock, extensive galleries being opened for the purpose.† They carried their excavations, we are informed, 200 feet or more to procure the chalchihuite‡ so much worn by them, and so highly prized as an ornament.

So the Mound-Builders, a much ruder race, mined for copper on the shores of Lake Superior, and for mica in the mountains of North Carolina.

Schoolcraft mentions the actual discovery of one of these ancient shafts in California, at a place called "Murphy's," one of the very places where these stone mortars have been found. At the bottom of this shaft, 210 feet in depth, a human skeleton was found, and "an altar of worship."§

We have here, therefore, an obvious explanation of these frequent discoveries of stone mortars in the gold-bearing gravel by the miners in California. They belong to the time of the Aztecs and Toltecs, and were probably used for the purpose of crushing the cemented gravel in which the gold is found.¶

* Vol. IV, p. 698, *et seq.*

† Ibid. II, 474.

‡ Ibid. IV, 673.

§ Schoolcraft's *Archæology*, I, 105.

¶ Cuts of these mortars may be found in "The Native Races of the Pacific States," or in "The Epoch of the Mammoth," pp. 395, 396.

A few years since it was asserted that a human fibula had been found under the glacial clay in the Victoria Cave, in Yorkshire, England, and Prof. Boyd Dawkins—perhaps the most learned of all the European archæologists—claimed that it established the fact that man in the North of Europe was *pre-glacial*. Remains of the domesticated animals have, however, since been found in the same bed, great doubt has been thrown over the glacial date of the clay, and the bone is now pronounced to belong probably to a bear. Although he had announced the discovery of pre-glacial man in 1874, Prof. Dawkins, at a meeting of the Geological Society of London held last year, formally retracted this declaration, and at a Conference of Anthropologists held in London at the Anthropological Institute, about the same time, it was generally conceded that there is no evidence of pre-glacial man in England.*

Prof. Rüttimeyer's sharpened sticks found in the inter-glacial bed at Dürnten, in Switzerland, are also given up in the last number of the *Edinburgh Review*;† and the first traces of man are thus brought down, by pretty general consent, to the close of the Quaternary period—the post-glacial epoch, when the rude flint implements referred to man appear in the river gravel and in the older bone caves. Here, gentlemen, we may pause.

Man appears—and appears fully developed—at the close of the Quaternary Period. The tertiary strata and the overlying quaternary beds have been carefully searched now for a series of years in Europe, America, and portions of Asia and Africa, and not a solitary bone has been found which belonged to any intermediate form between man and the ape. I will quote on this point the declarations of the eminent Prof. Virchow of Berlin, at the Con-

* See Proceedings of Geolog. Soc. of London, April 11, 1877, and a Report in *Nature*, vol. xvi, No. 397, p. 106, of a discussion at Anthropolog. Institute.

† April, 1878, article on "Bronze Age."

ference of German Naturalists and Physicians held at Munich in September last:

There are at this time few students of nature who are not of opinion that man stands in some connection with the rest of the animal kingdom, and that such a connection may possibly be discovered, if not with the apes, yet, perhaps, as Herr Vogt now supposes, at some other point. I freely acknowledge that this is a desideratum in Science. I am quite prepared for such a result, and I should neither be surprised nor astonished if the proof were produced that man had ancestors among other vertebrate animals. You are aware that I am now specially engaged in the study of anthropology, but I am bound to declare that every positive advance which we have made in the province of prehistoric anthropology has actually removed us further from the proof of such a connection.

He goes on to speak of Quaternary man, and then proceeds as follows:

When we study this fossil man of the quaternary period, who must of course have stood comparatively near our primitive ancestors in the series of descent, or rather of ascent, we always find a man just such as men are now. As recently as ten years ago, whenever a skull was found in a peat bog, or in pile-dwellings, or in ancient caves, people fancied they saw in it a wonderful token of a savage state still quite undeveloped. They smelt out the very scent of the ape—only the trail has gradually been lost more and more. The old troglodytes, pile-villagers and bog people prove to be quite a respectable society. They have heads so large that many a living person would be only too happy to possess such. Our French neighbors, indeed, have warned us against inferring too much from these big heads. It may have been that their contents were not merely nerve substance, but that the ancient brains may have had more connective tissues than is now usual, and that, in spite of the size of the brain, their nerve substance may have remained at a lower stage of development. This, however, is but a sort of familiar talk which is employed in some measure as a support of weak minds. On the whole we must really acknowledge that there is a complete absence of any fossil type of a lower stage in the development of man. Nay, if we gather together the whole sum of the fossil men hitherto known and put them parallel with those of the present time, we can decidedly pronounce that there are among living men a much greater number of individuals who show a relatively inferior type than there are among the fossils known

up to this time. Whether it is just the highest geniuses of the quaternary period that have had the good luck to be preserved to us, I will not venture to surmise. Our usual course is to argue from the character of a single fossil object to the generality of those not yet found. This, however, I will not do. I will not affirm that the whole race was as good as the few skulls that have survived. But one thing I must say—that not a single fossil skull of an ape or of an anthropoid ape has yet been found that could really have belonged to a human being. Every addition to the amount of objects which we have obtained as materials to discuss have removed us further from this hypothesis.

As I have already remarked, I have no idea this morning of discussing the question of Evolution. But I just want to call your attention to this great fact of this immeasurable gap between man and the most advanced of all the brute forms. Whatever be true back of all this—however cogent may be the argument for the evolution of the Simian types from the lowest animal forms through the ages of geology, the evidence stops with the brute creation, and the theory as applied to the evolution of man, as the matter now stands, is entirely unsupported by any facts. The only hope held out of finding the missing links (of which, in order to be successful, it would be necessary to find not one, but a great many) is that suggested by Sir Charles Lyell* and Dr. Peschel, that as the habitat of the anthropomorphous apes is in tropical countries, the missing apes may hereafter be found in Western Africa or the islands of Borneo and Sumatra, which, it is remarked, have not yet been explored; or in a lost district of the earth (supposed to be lost) in the Indian Ocean, between Africa and India, which Peschel names *Lemuria*. Mr. Alfred Russell Wallace has, however, very pertinently observed on this, that in Miocene times an almost tropical climate prevailed in the South of Europe, and that we must suppose even the earliest ancestors of man to have been terrestrial and

* Antiq. of Man, last Eng. edit. p. 538. See Races of Man by Peschel, a most valuable work.

omniverous (and so, widely dispersed); and, therefore, the European strata would be as likely to furnish the missing links as equatorial Africa.*

This gulf between man and the gorilla has not been bridged over; and there are others in the geological record that are equally wide and abrupt.

As there is a great gap between the beasts of the field and man, so there is an unbridged gulf (unless the few diminutive marsupials of the Triassic and Jurassic periods should be regarded as furnishing one of the missing links) between the Reptilian forms and the Birds of the Secondary Age and the Mammals of the Tertiary. Carnivorous and herbivorous mammals, in great numbers, and of many species,—and strangest of all, the monkeys—appear upon the scene at the base of the Tertiary with the most startling abruptness—unheralded and with no evolutionary trumpet to sound their approach.† The uppermost Cretaceous beds, which is the closing member of the Secondary, have been generally supposed to represent a period of great disturbance in the geological history, which was concluded from the fact that in Europe and elsewhere the Eocene beds of the Tertiary were found to lie unconformably, on the tilted or crumpled Cretaceous beds. It was conjectured that these traces of disturbance indicated a *lost period* between the Cretaceous and the Eocene, and that if these lost leaves could be recovered the gap in the succession of life would be bridged over by the detection of the intermediate forms. But Prof. Hayden, who, as you

*Address before British Association in 1876.

† In the oldest Eocene beds (Wahsatch beds of the Green river and San Juan basins) Cope finds eighty-seven species of vertebrates, two-thirds of which are mammals. In the Fort Bridger beds of the Green River basin (Middle Eocene) Marsh finds 150 species of vertebrates, of which the larger number are mammals, some Herbivora, some Carnivora, some Lemurine monkeys. Le Conte's Geol., p. 495.

know, has been actively engaged for some years in the exploration of our Western Territories, finds that in some places, especially on the Plains, a continuous series of conformable rocks connects the two eras. "The record," says Le Conte, "seems to be continuous." And yet here there is the same sudden and extraordinary change in the life-system which we observe in the unconformable strata of Europe. "The abruptness of the transition," says Dana, "is astounding."* Now in some regions the Cretaceous beds were formed in deep-water, and we could not expect ordinarily to find remains of terrestrial fossils in them; but this is not true of the Rocky Mountain or Atlantic border deposits of North America, nor of those of many localities on other continents. Le Conte observes that it is impossible to explain these facts on the theory of evolution "unless we admit *periods of rapid evolution*,"† or, as he elsewhere expresses it, "paroxysms of evolution."

As there is a break between the Tertiary and the later Quaternary (the Reign of Ice intervening), and a break between the Secondary and the Tertiary, so in passing from the Lower to the Upper Silurian and Devonian, the seas suddenly swarm with gigantic and highly-organized fishes. In a moment—in the twinkling of an eye—with no suspicion of a break in the record—we pass at one leap from the Mollusks and Crustaceans of the Lower Silurian to the Sharks and Gar-Fishes of the Upper Silurian and Devonian. Some of these fishes were from twenty to thirty feet in length, and belonged to a very advanced type of fishes, being allied to the Reptilian forms. "It is impossible," says Le Conte, "to overlook the *comparative* suddenness of the appearance of a new class—fishes—and a new department—vertebrates—of the animal kingdom." "Observe," he continues, "that at the horizon

* Manual of Geology, last edit., p. 602.

† Elements of Geol., p. 475.

of appearance in the Upper Silurian, there is no apparent break in the strata, and therefore no evidence of lost record; and yet the advance is immense. It is impossible to account for this unless we admit paroxysms of evolution, &c.”*

But there is yet another startling apparition in the succession of palæontological forms: if we go back to the Lower Silurian resting on the Archæan or Eozoic rocks, we find the highly-organized Trilobites and Cephalopods—heading, as it were, the long succession of animal life. In the Archæan rocks we find only the lowest Protozoan life—the questionable, systemless *Eozoon Canadense*;† and with the very dawn of the next era we find “all the great types of structure except the vertebrate.” “And these,” adds Le Conte, who believes in Evolution, “not the lowest of their type, as might have been expected, but already trilobites among the Articulata and cephalopods among Mollusca—*animals which can hardly be regarded as lower than midway in the animal scale.*”‡

As the facts now stand, it seems to me impossible to reconcile them with Evolution as taught by the disciples of Mr. Darwin in Europe. To evade the difficulty our American Evolutionists (in which they were preceded by Mr. St. George Mivart) have invented the theory of *Paroxysmal Evolution*—Evolution by leaps. There was a leap from the plant-like Protozoan to the huge Crustaceans with their great many-lensed eyes, and to those monster straight-shelled nautili or cuttle-fishes (some of them fifteen feet long) which were the scavengers of the Silurian seas. There was a sudden leap from these Crustaceans and Mollusks, with no inter-

* Elements of Geol. p. 333.

† There is some reason to believe that fossils occur in the Huronian beds—the upper stratum of the Archæan; but the point is not yet settled. This Huronian, it is thought, may prove to be altered Silurian. Certain alleged discoveries have been made in New England; but the subject has not as yet been thoroughly studied.

‡ Elements of Geol. p. 288.

vening forms, to the monster sharks and gar-fishes of the Devonian. There was a sudden leap from the Fish to the Amphibian. There was a sudden leap from the great Saurians of the Secondary Age to the abounding mammalian life of the Tertiary strata; and finally, by a similar evolutionary paroxysm, some ape-like organism, about the close of the Glacial Epoch—quick as the re-adjusted crystals of the kaleidoscope—assumed abruptly the human form.*

* These abrupt and tremendous changes in the succession of geological life are fatal to the theory of gradual evolution. In the first place, there is in some of the instances no indication of any missing pages from the record; the text seems to be unmutilated and continuous. This is notably the case in the transition from the crustaceans and mollusks to the fishes.

But, in the second place, if intermediate forms between the trilobite and the fish, or the ape and man, once existed, what has become of them? The missing links, if such there were, must have been considerable in number, and the individuals representing each link in the chain must have existed by tens of thousands and millions. The transitional forms must have been a hundred times more numerous than the completed type, and yet we find perfect trilobites and perfect fishes, perfect apes and perfect men, and no trilobites in transitu to fishes, and no apes in transitu to men—although we ought to meet them at a hundred points. Where are the intermediate forms between birds and mammals? We ought to find hundreds of these intermediate forms, with imperfectly developed organs; if they existed, there is no reason why we should always miss just these transitional forms, and no others. If we had missed them in one country, we ought to find them in another. The same gaps essentially are reproduced in Europe, Asia, North America, South America, Africa, and Australia. The alleged pedigree of the horse, and such forms as the *archæopteryx*, and the many similar discoveries which will be made, do not seriously touch this difficulty. The great chasms to which I have referred still remain, and will not be appreciably diminished by these discoveries. If it should be asserted that the silver dollar had been gradually developed by some natural process out of the copper cent, and we should be able to discover only one-cent pieces, two-cent pieces, three-cent pieces, five-cent pieces, ten-cent pieces, quarters, half-dollars, and dollars; and if, moreover, exactly the same pieces, and no others, were found in all parts of the world, the theory would have to be abandoned; because it would be incredible, if the four-cent pieces, the six-cent pieces, the seven-cent pieces, the eight cent pieces—the thirty-cent pieces, the forty-cent pieces, the seventy-cent pieces, &c.—once existed as transitional links, that we should always miss just these particular pieces, and always find just the others in all parts of the world. Unless we could assign some good reason for the disap-

This is the present position of the question. A common ground has been reached on which Evolutionists and non-Evolutionists can stand—the sudden apparition of new and widely-divergent types. As to the *origin* of these new forms Science knows nothing. The field for conjecture is open. Those who believe in specific acts of creation,* on the ground of a Divine Revelation on the subject, may hold their opinion; those who do not believe in the revelation may refer the apparition of the Trilobite, the Shark, the Saurian, the Tapir, and Man, to a certain “internal force or tendency,” or to a sudden change in the climate, the physical geography, the atmosphere, or some abnormal natural cause, deemed by them sufficient to produce the results.

Our present business is with MAN: that he appeared *suddenly*, as the evidence stands, is generally conceded. It has been mentioned also that, according to Prof. Virchow, the first human skulls which we encounter are remarkable for their large cerebral cavity. To the same purport Dr. Pruner-Bey, speaking of the skulls which were obtained from the palæolithic station of Solutré, in Eastern France, remarks, that we find here “no approach to the Simians—Man was constituted man in the full force of the term.” Dr. Broca bears the same testimony as to the skulls from the Cro-Magnon cave at Les Eyzies, as does Prof. Owen with regard to the skulls obtained from the rock-shelter of Bruniquel. The celebrated Engis skull, which was found in Belgium under a floor of stalagmite, associated with bones of the rhinoceros, mam-
pearance of all the missing pieces, we should be compelled to conclude that they never existed. In that case, if we still held to the doctrine of evolution, we should have to adopt the paroxysmal evolution of Mivart and Clarence King, and assert that the quarter was developed out of the ten-cent piece by a paroxysmal act, and the dollar out of the half-dollar by a yet more violent process. This of course is merely an illustration.

* Which, in some of the stages, need not exclude a basis of pre-existing animal or vegetable life.

moth, &c., is, says Prof. Huxley, "a fair average skull, which might have belonged to a philosopher, or might have contained the thoughtless brains of a savage." The Neanderthal skull, about which so much has been written, has a capacity of 75 cubic inches, greater than the average Malay, and double that of the largest gorilla skull known. A good deal of misplaced discussion was wasted on this skull by Prof. Huxley, Lyell, Schaaffhausen, and others, as there is no evidence whatever of its antiquity.

Let us advance a step farther:—we have seen that man appears in Western Europe unheralded by any earlier anthropoid forms, and "constituted man in the full force of the term:" how was it in the East—for man *originated* there? The affinities of the Cave-Dwellers of Europe with the modern Eskimo are admitted by Prof. Dawkins and other writers on the subject,* they both belong to the great Turanian family—the great Uralo-Altaic or Turko-Finnic race—the ancient Asiatic Scythians—the great Mongol race, which passed into North America—and which is recognized again as one of the original elements of the primitive inhabitants of Chaldæa or Babylonia. The climate of Europe at this time was too cold for the Troglodytes to have originated there: it is generally conceded that the original home of the race was in Central Asia. The Egyptians, it is remarked by Brugsch Bey, migrated from the centre of Asia.

Now the most astounding fact in all this matter is that in Babylonia, on the Lower Euphrates, and in Egypt, where the Egyptologists and Assyriologists have obtained, of late years, such interesting results, man suddenly appears, and the very first signal which he throws out are those vast Temple-Towers of the Chaldæan Plain and those yet more wonderful Pyramids which are perhaps the greatest structures ever erected by man. This is the first glimpse which we catch of man in the East.

* Dawkins' Cave-Hunting, p. 358; Quarterly Review, Oct. 1876.

In the West we found him a fully developed man, but a savage: in the East he intrudes upon the stage in the habiliments of civilization. Strange as it seems, we meet him at the very outset in the character of a great Builder, and fashioning works of statuary whose anatomical correctness is not surpassed by the figures of Michael Angelo. There was a knowledge of the cuneiform writing from the very first in Babylonia, and the hieroglyphics of Egypt were used in the Fourth Dynasty, at which time they had already assumed the cursive form.

A more modest picture is presented us in the first glimpse that we catch of the primitive Aryans in their early seats on the Oxus and Jaxartes; they are not building any great cities, but they are settled in villages with a kingly government, tilling the soil, contracting marriages, fortifying their towns, harnessing horses and oxen to carriages, with helmets and shields and swords of bronze, and worshipping the holy Ahuramazda, "creator of existing worlds, truth-telling," from whom proceeded "the creative Word, which existed before all things, * * * having its germ in truth."

Up to the present time Archæology has sought in vain for any earlier trace of man in these regions. In Egypt and Babylonia they have succeeded in finding stone implements, but they have been found there (in Babylonia very rude ones) in the tombs, associated with objects of an advanced civilization. Or they have been found on the surface of the ground in the valley of the Nile, and were in use, according to M. Mariette, not only in the Pharaonic but even in the Greek period.* There is no *evidence* of a Stone Age of any sort, in Egypt or Babylonia, and no *trace* of the Palæolithic or First Stone Age.

* Archiv für Anthropologie, Januar, 1876, s. 250; Matériaux pour l'Histoire de l'Homme, 1874, p. 17; Smith's Ancient Hist. of East, Eng. edit., vol. I, p. 210; Rawlinson's Five Great Monarchies, 2nd ed. I, pp. 95, 119, 120.

But it is obvious that if man has been on the earth one hundred, or two hundred, thousand years, he ought to have left his relics in the valleys of the Nile, Euphrates, and Tigris. No palæolithic implements associated with bones of extinct animals, have been found in any of these countries. And it is impossible that man could have reached the civilization of the Third Chaldaean and the Fourth Egyptian dynasties without leaving his monuments and his implements strewn all along the way, if he was actually living in these localities tens of thousands of years before the date assigned to Menes.

This fact, that there is nothing in Egypt behind the Pyramids, and nothing in Babylonia behind the bricks of Erech and Calneh, cuts below the whole evidence for the antiquity of man in Central and Western Europe; but it is more satisfactory to give our attention directly to the remains of human art found in Europe under circumstances which have naturally occasioned a belief in their great antiquity. Of course in this brief address the points must rather be only rapidly touched, than elaborately discussed.

It is alleged that the prehistoric period is divided into three ages—the Age of Stone, the Age of Bronze, and the Age of Iron; and the Age of Stone is further subdivided into the Palæolithic (or Old Stone) Age and the Neolithic (or Polished Stone) Age. The Polished Stone Age is said to have been in progress in Europe some six or seven thousand years ago; the Palæolithic Age goes back one hundred, or two hundred, or five hundred, thousand years. The relics of the Stone Age are found in the ancient Stone-Graves, in the Lake-Dwellings, the Shell-Mounds, the Peat, in Caves, and in the so-called drift of the River-Valleys.

A few years ago it was claimed that those mysterious Stone Circles and other Rude Stone Monuments which occur in so many parts of the world—in Europe, Asia, Northern Africa, Peru—belonged to a very remote past, and Stonehenge was

affirmed in 1870 in the *British Quarterly Review*, to be as old as the foundations of Memphis, while Carnac and Locmariaker, in Brittany, it was said, "have presented a yet more startling message from the depths of their hoary antiquity." Stonehenge, which is assigned to the Bronze Age, would, of course, be comparatively recent by the side of the chambered tumuli of Carnac, which are assigned to the Stone Age; and if this so-called Druidical circle, with its hewn stones, is as old as the Egyptian monarchy, the rude stones of the great circle of Avebury and the avenues of Carnac must have been erected several thousand years before the Pyramid-Builders entered the valley of the Nile.

But it is now pretty well ascertained that the majority of these structures in Europe and North Africa are post-Roman, and none of them it is probable, almost certain, date farther back than six or seven centuries before our era. Implements of iron have been found in the very oldest.*

In 1854 the learned world was startled by the announcement that traces of an entirely unknown and very ancient population had been found in Switzerland. In one of the lakes of this country the first discovery had been made of the remains of the early habitations of the Lake-Dwellers. Many similar discoveries were afterwards made, not only in Switzerland, but throughout Europe. Ancient piles were discovered, sometimes nearly a quarter of a mile from shore, driven into the bottom of the lakes, and numerous implements of stone and bone, with fragments of pottery, animal bones, and other objects were dredged up from the lake-mud. Agassiz exclaimed (and we all know the caution of that truly great man)—Agassiz, in a lecture before the Boston Natural History Society, as late as 1868, exclaimed, that "Man was at last connected with geological

* See "Recent Origin of Man," chap. ix.; *Archiv für Anthropol.*, Januar, 1876, s. 283, 284, 285.

phenomena!" and Sir Charles Lyell and Sir John Lubbock estimated that this newly-discovered race had lived in Switzerland at least 6,000 or 7,000 years ago.

But the antiquity of these remains also, like that of the Stone-Graves, has vanished before more sober investigations. It has been observed that the lake dwellings are delineated on the great Historical Column of Trajan at Rome, which was erected to commemorate the victories of that Emperor over the Dacians in the year 114. They are also referred to by Herodotus and Hippocrates, and in numbers of them Roman coins or tiles and pottery, and swords of iron and bronze, have been found. Crucibles for melting bronze have been found in the lowest bed of one of the very oldest—Robenhausen;* and Mediterranean coral and plants, as well as objects of glass or metal, have been found in others regarded as being the most distinctively of the Stone Age period. Indeed it is ascertained that these lacustrine habitations existed at Noville and Chavannes in Switzerland as late as the 6th century of our era: in another in the Lake of Paladru, in France, a number of objects of the Carlovingian epoch were found; and in Pomerania and Sweden it is now known that they were occupied as late as the 11th and 13th centuries.†

The Shell-Mounds on the Danish coasts were cited too by such writers as Lubbock and Lyell as memorials of a vague and indefinite past. Worsaae estimated them to be so old that he referred them to the Palæolithic Age, and Sir John Lubbock called them post-Palæolithic, meaning thereby pre-Neolithic. But metal has since been found in one which appears from the extreme rude-

* Dr. Keller's *Lake-Dwellings*, 1st ed., trans., p. 57; *Quarterly Review*, October, 1868.

† *Comptes Rendus, Acad. des Sciences*, 1872, p. 204; *Matériaux pour l'Histoire de l'Homme*, 1874, p. 320; *Archiv für Anthrop.*, August, 1875; Dr. Keller's *Lake-Dwel.*, 2d Eng. edit., vol. i, 629.

ness of the stone implements to be one of the very oldest, and a shell-mound in one of the Channel Islands, between France and England, revealed, along with implements of stone, Roman pottery and objects of iron. So that the Kjökken-möddings and Lake-Dwellings as well as the Cromlechs and Dolmens, may be regarded as tacitly withdrawn from the evidences for the antiquity of man.

You are aware that a good deal of prominence is given in the discussion of this subject to the recognition in Prehistoric Archæology of the Three Ages, to which I have referred—the Age of Stone, the Age of Bronze, and the Age of Iron. These distinctions have, however, been greatly exaggerated. As I have already remarked, there was no Stone Age in Egypt or Babylonia. There appears to have been no Stone Age in Africa. Iron has apparently been known there from the most remote times. There was no Stone Age from the River Kama in Russia to Lake Baikal in Eastern Asia—among the great Uralo-Altaic or Mongol race.* Stone and bronze were used together by the ancient Mexicans and Peruvians, when these continents were first visited by the Spaniards, as they were by the ancient Trojans, both before and after the period described in the Homeric poems.† Implements of stone, bronze and iron, were all found in the ancient ditches before Alise, in France, where Cæsar captured Vercingetorix and his great army.‡ They are commingled in the graves between Trévoux and Riottier, on the Saône, where Cæsar fought with the Helvetii.§ And within

* Epoch of Mammoth, pp. 219, 221, 229, 230, 233; *Expedition to Zambesi*, by Dr. Livingstone, pp. 561, 562; *Descrip. Sociol.*, Herbert Spencer, *Asiatic Races and African Races*.

† Epoch of Mammoth, 232, 293 *et seq.*; Prescott's *Conq. of Mex.* I, 139, 441, 442; *Conq. of Peru*, I, 152; Schliemann's "*Troy and its Remains*," *passim*.

‡ Palafittes of Lake of Neufchâtel, trans. Smithson. Rep., 1865, p. 400.

§ Napoleon III.'s "*Life of Cæsar*," II, p. 65.

a few years past in the great Merovingian cemetery at Caranda, in the department of Aisne, in France, thousands of flint knives and arrow-heads occur along with the iron swords and bronze jewellery of the warlike Franks.*

Up to this point there is no difficulty. The evidences for the antiquity of man derived from the Stone-Graves, the Lake-Dwellings, the Shell-Mounds, or from any supposed high antiquity for the Polished Stone Age, all fail, and are readily disposed of.

* *Matériaux*, 1875, p. 108.

The discovery of the flint implements in the Babylonian and Egyptian tombs, along with implements of metal, shows at once that the flint implements in the European stone-graves, lake-dwellings, &c., do not imply a remote antiquity. Of course the metals were much later in reaching Western Europe than they were in reaching Egypt. Among the Swiss mountains and in Britain stone implements continued to be used after the Christian era. We know approximately the date of the Babylonian and Egyptian tombs: when the primitive tribes moved from their Asiatic seats into the forests of Europe, they left the metals behind them. They used stone in a little while exclusively. They had no metal, and were too ignorant, weak, and scattered, to find it and to work it. If the builders of the temple-towers of the Chaldean plain used stone implements [along with metal], the hunters of the Reindeer in the valley of the Vezère would use stone weapons exclusively, and it would be long before metal reached their descendants.

This is illustrated yet more vividly by the relic-beds at Troy described by Dr. Schliemann. There are five successive beds, the highest being that of the Hellenic Period, dating after 650 B. C. In all the other beds both stone and bronze (no iron) occur. The Homeric Trojans were far more familiar with stone knives than they were with metal knives. The *chiefs* of course had bronze armour, offensive and defensive.

In the third bed (ascending) the implements are almost *exclusively* stone. This was after the Trojan War—conjecturally about 1,000 B. C. Some of the neighbouring tribes (ruder than the Trojans, but of the same blood) occupied the site of the devastated city (there are abundant traces of a conflagration) after the war. Perhaps they were settlers from Greece—possibly some Scythian irruption. But the fact remains, that in Asia Minor, at a period when there was an advanced civilization from the Tigris to the Mediterranean—about the time when King David reigned in Jerusalem—the site of Troy was inhabited by a stone-using people. How was it at the same date in the marshes of the Somme Valley?

There is a much more difficult branch of the subject—the *Palæolithic Age*. Human implements (as is claimed) were found by M. Boucher de Perthes in 1844 in the river-gravel deposit of the Somme River in a geological position assigned to the drift period, and in association with the bones of the elephant, rhinoceros, cave-bear, hyæna, reindeer, and other extinct animals. Since that time a great many similar discoveries have been made, and implements of bone, as well as stone, evidently prepared by man, have also been found, associated with the same extinct animals, in caves, sometimes under solid floors of stalagmite; and in these caves there have been found also among the relics referred to delineations on horn and bone and stone, some of them beautifully executed, of the reindeer and other extinct animals.

The case of the River-Gravel is much the most difficult. In that of the Caves the two principal difficulties are the presence of the extinct animals and the floors of stalagmite—at Kent's Cavern, in Devonshire, there are two floors, one beneath the other, and both above the relics, and the lower one from 5 to 12 feet thick. The first difficulty—that of the extinct animals—is common to the gravels and the caves; the stalagmite, therefore, is the special point about the caves requiring explanation, if it is insisted that the relics are recent. At the meeting of the British Association, in 1871, Mr. Vivian remarked that, at the present rate of the formation of stalagmite, it would take 1,000,000 years for the stalagmite in Kent's Cavern to form; and Mr. Alfred Russell Wallace and Mr. Pengelly assign to the relics beneath the floors an antiquity of 500,000 and 750,000 years. Lyell also lays great stress on these floors as an evidence for the antiquity of man, as does Mr. John Evans. But more exact observations have also reversed this verdict. Stalagmite is now forming in the Ingleborough Cave in Yorkshire at the rate of nearly one-third of an inch per annum, and Mr. Boyd Dawkins,

who reported the fact, refers to the matter in his work on "Cave-Hunting" as follows: "It is evident from this instance of rapid accumulation that the value of a layer of stalagmite, in measuring the antiquity of deposits below it, is comparatively little. * * At the rate of a quarter of an inch per annum, twenty feet of stalagmite might be formed in a thousand years."*

Similar observations have been made at the caves of Matlock and Poole's Hole, and in the Gibraltar caves explored by Capt. Brome, and there is at San Filippo, in Italy, a solid mass of travertin (which is formed just like stalagmite) thirty feet in thickness, which was deposited in twenty years.† The stalagmite, like the lake dwellings and shell-mounds, is, therefore, I think, also given up, and we may confine ourselves to the phenomena presented in the river-gravels.

The flint implements which are referred to man, are found in a bed of gravel in the Valley of the Somme at a depth of from 15 to 25 feet from the surface, the gravel deposit itself sometimes attaining a thickness of 15 or 20 feet, and being overlaid by beds of sandy marl, angular gravel, and brick-earth or loess. The gravels range from the bottom of the valley as high as 80 or 100 feet above the present level of the stream, and the implements occur alike in the upper as well as the lower gravels. The valley at Amiens is a mile or a mile and a half wide; and you will therefore perceive that when the upper gravels were deposited the water of the river must have flowed 80 or 100 feet higher than it does now, and must have rolled over points now half a mile and more distant from the present stream. At this distance from the river, high up on the slopes of the valley, twenty feet and more beneath the surface, we find the famous flint axes of St. Acheul. The age of these axes is that of the bed of gravel.

* Cave-Hunting, p. 39-41.

† See Lyell's "Principles" I, 399; also Le Conte's Elements Geol., p. 71-72.

In the valley bottom there is a bed of peat resting on the gravel, which sometimes attains a thickness of twenty-five or thirty feet, and which is of course more recent than the subjacent gravel. In this bed of peat we find relics of the Middle Ages, of the Roman and Gallo-Roman periods, and of the Age of Polished Stone. The fauna represented in it corresponds with the present or recent fauna of the country.

These are some of the *indicia* of the vast amount of time which appears to have elapsed since man hunted the mammoth in this valley; but they are not all. The theory of Sir C. Lyell and Mr. Evans and Sir John Lubbock is that the river has excavated this broad and deep valley since the high-level gravels were laid down; that the river, some million years or more ago perhaps, ran some 100 feet higher than its present bed, and that it has gradually and slowly cut its way down to its present position. Man was living when this work of excavation commenced.

There is yet another great fact implying the lapse of ages since these axes were manufactured. There has been a great change in the physical geography of the country. The French coast on the north is now 100 feet higher above the sea-level than it was at that time, and so it is across the channel in England on the coast of Hampshire. Indeed it is asserted that during the Palæolithic Age England was united to the Continent—that the bed of the North Sea between England and Holland was a great undulating plain, traversed from south to north by a mighty river, which united the waters of the Thames and the Rhine into a common trunk, and discharged them into the Northern Ocean. Europe and Africa, at the same time, were united by a bridge of land from Sicily to Cape Bon. Is it strange that even cautious geologists, like Lyell and Evans and Prestwich, and even Dana, with these facts before them, should have received the impression that long ages, only to be

estimated on the geological scale, have elapsed since the ancestors of our American Eskimo gazed from their primeval caves in Europe upon these scenes?

If man is recent, we have, as appears from what has been said, in connection with the presentation offered by the river-gravel, the four following difficulties to explain: 1. The formation of the Peat; 2. The alleged excavation of the valleys, and the enormous mass of gravel and loess deposited; 3. The great change in physical geography; 4. The presence of the extinct animals. I shall address myself briefly to these in order:

1. *The Peat*.—This, as stated, is sometimes twenty-five or thirty feet thick, and lies on the gravel. Boucher de Perthes, with the apparent concurrence of Lyell and Lubbock, estimate 30,000 years for the growth of this peat alone—which would only take us to the Neolithic Age.

There are, however, some tolerably precise data going to show that Boucher de Perthes' estimate is not correct. There are found in the peat the undecayed and erect stumps of the birch tree, three or four feet high. Now birch stumps, as Dr. Andrews has remarked, will not endure exposure in a damp locality more than fifty years without decay. Oak stumps would not last more than a hundred years. The peat, therefore, must have covered up these stumps before they had time to decay—that is, it must have grown three or four feet in fifty years, which is six feet in a century. At one-fourth this rate the whole thirty feet might have formed in 2,000 years. A coin of the Emperor Gordian was found in the peat at Groningen, in Holland, at the depth of thirty feet, and in Ireland brass spurs, implements of iron, vessels containing butter, shoes, and other articles, have been found at fifteen and twenty feet.* In this very Abbeville peat Roman amphoræ,

*See many instances cited in "The Epoch of the Mammoth," p. 307, *et seq.*; Steele on Peat-Moss, pp. 282-85; Phil. Trans. of Royal Soc. of London, vol. xxvii; Sir W. R. Wilde's Catalogue Antiq. etc. in Royal Irish Acad.

iron and bronze implements, objects belonging to the epoch of the Lower Empire, have been found at great depths, and Lyell himself, in his "Principles of Geology," mentions that a boat loaded with Roman bricks was found at Abbeville at the very bottom of the peat bed.* The peat, therefore, need not detain us.

2. *The Excavation of the Valley and the Beds of Gravel and Loess.*—I have stated that the English geologists believe that man was living in the Somme and Thames valleys when the high-level gravels were deposited by the rivers, and that he continued to live there and witnessed the gradual excavation of the valleys by the streams.

Now the Somme Valley at Abbeville and Amiens is, as already mentioned, a mile or a mile and a half wide, and about 200 feet deep. The river is about 50 feet wide—one-half the size of the Rivanna. From its source to its mouth its total length is 124 miles, and the fall is 1.77 feet per mile. When the alleged work of excavation commenced, this little stream was running 140 feet higher, on an almost dead level, and the fall per mile was then about seven inches. The work it had to do was to sweep the vast volume of chalk from the valley, roll its flints into gravel and sand, and deposit these gravels all over the valley in beds sometimes of 20 feet thickness. Some of the gravels are larger than a man's head, and there are sandstone boulders weighing a ton. Could a little stream, probably not more than half an inch deep, with a fall of seven inches to the mile, perform such a work? To my mind it is just one of those hypotheses which needs only to be plainly stated to be immediately rejected as incredible.

The true source of the gravel and loess deposit which we see

* Lyell's "Principles," 12th edit., ii, 512. *Antiquités Celtiques et Anté-diluviennes* (M. Boucher de Perthes), i, pp. 54, 155, 186, 201, 213, 447.

in the river-valleys of Europe and this country, is the *Palæolithic Flood*—what Dr. Andrews designates as *the Flood of the Loess*, whose traces are abundant in India, and in the valleys of the Tiber, the Rhine, the Mississippi, and the James, as well as in France and Southern England. I think this is the almost universal opinion out of England. M. Boucher de Perthes himself attributed the phenomena to a cataclysm. M. d'Orbigny, rejecting the theory of marine action, referred them to immense inundations of fresh water. M. Dupont, in his celebrated Report to the Belgian Government on the Belgian Caves, affirms as a matter not admitting of dispute, that the contemporaries of the mammoth were overwhelmed by a deluge, which must have covered nearly the whole of Belgium. So M. Belgrand (who is represented by Prof. Busk to have enjoyed unusual opportunities for studying this subject), in his work on "*Le Bassin Parisien aux Ages Anté-historiques*," remarks that the floods of the Palæolithic times were extremely violent, and that the amount of rainfall was so great that it rolled on the surface of the most permeable soils.* Prof. Dawson of Montreal, Prof. Andrews of Chicago, and Mr. Alfred Tylor, F. G. S., all concur in this view, Mr. Tylor propounding the theory of a *Pluvial Period* following the Glacial Period. He observes that the Glacial Period must necessarily have been followed in the region to the south of the glaciated area, by a period of prolonged and excessive rainfall. Prof. Dana, in his *Manual of Geology*, describes at length this great flood which was occasioned, he says, by the melting of the glacier. Dana, however, makes this flood continue through the whole of his Champlain epoch, which he believes commenced immediately at the close of the Glacial Period. This Palæolithic Flood was in all probability merely a repetition of one or more similar deluges which had occurred in the Glacial Period, when,

* Jour. Anthropol. Instit., January 1873, p. 433.

as we know, the land in England, Scotland, and Scandinavia, was submerged from 500 to 2,000 feet, while in the valley of the Danube the inundation mud is found at a height of 1,300 feet. Le Conte likewise takes a post-glacial flood for granted, and, so far as I know, the excavation theory as held in England is not entertained for a moment by the geologists of other countries. The mass of gravel which we see may have been brought down by the glacial floods, and been afterwards only re-assorted by the post-glacial flood.*

Such a flood accounts for the high level of the streams, and for the deposition of the gravel and the river-silt; and the only question with which we are concerned is the date of its occurrence. The Somme River doubtless ran at this time 150 feet above its present level, and filled its valley from bluff to bluff. The James River at Richmond was probably five or six miles wide. You know that now in the course of a few days the Ohio rises 60 feet at Cincinnati. The Tennessee River at Chattanooga rose 51¼ feet on the 2nd of March, 1875. M. Reclus mentions that on the 9th of October, 1837, the Ardèche, a small affluent of the Rhone, at the bridge of Gournier, rose 70 feet above low-water mark; and that in 1857 it rose 60 feet.† The melting snows and the extraordinary rainfall of the Palæolithic Period may have extended over several centuries, for I have no idea

* The point is settled by the high level beaches of the Great North American Lakes. On Lake Michigan there are two ancient beaches, showing that the water formerly stood at higher levels. Both of these beaches are post-glacial. Now it is just as reasonable to insist that the basin of the lake has been gradually excavated since the glacial epoch from the level of the Upper Beach down to its present bottom, as to argue that the valley of the Somme has been excavated by the river during the same period. Similar beaches exist on the other lakes of this region, showing that, like the rivers, they too stood at a much higher level during the prevalence of the post-glacial flood. See note at end.

† The Earth, p. 324.

that the immense amount of the gravel and loess which we see in the river-valleys was deposited in a day.*

3. *The Change in the Physical Geography.*—The next difficulty to be met is the great change in the physical geography of Europe since the epoch of the mammoth. I have mentioned that it is alleged that when man appeared in Western Europe, the bed of the German Ocean, between England and Holland, was a wooded plain over which the mammoth and the rhinoceros roamed with the other palæolithic animals. This is probably (but not certainly) true. I say not certainly, because there is no evidence that man had appeared quite so early as this; the mammoth we know had done so, for the teeth and bones of this animal, as well as those of the rhinoceros, horse, and reindeer, are dredged up in vast numbers in the German Ocean, and have been likewise obtained from the English Channel. There was a sinking of this land, and a subsequent partial re-elevation, about the close of the Palæolithic Age—the movement having probably been continued since. The whole movement of subsidence and elevation may perhaps have amounted to 400 or 500 feet.

The English Channel and the North Sea between Holland and England are quite shallow. An elevation of the sea bottom of 150 feet would, according to Prof. Geikie, drain nearly all of the German Ocean between England and the Continent.

This change in the physical geography of Europe, it is urged, implies a vast period of time, and Lyell assumes that two and a half feet per century is about the rate at which these elevations and subsidences progress. A movement of 500 feet at this rate would require 20,000 years.

These movements of the crust of the earth are familiar to

*There is another fatal objection to the excavation theory: the fauna of the high gravel beds is identical with that (and so are the implements) of the lower beds. But in the ages which must have elapsed, according to the theory, there ought to have been a change in both fauna and climate.

geologists, and they were especially characteristic of the Glacial Period. According to M. Morlot the region of the Alps sank 1,000 feet during this epoch. At Moel Tryfan in Wales Lyell identified fifty-seven species of marine shells in stratified sand and gravel overlying the boulder drift, at the height of 1,390 feet. As is to be expected, such movements continued, though with less intensity, after the Glacial Period, and are in progress at the present day. The foundations of the old Roman docks near Falkirk and Edinburgh, and the discovery of Roman pottery and marine shells on a raised beach near the latter city, show that the eastern coast of Scotland has been raised 25 feet since the Roman galleys sailed into the Firth of Forth. The shores of the Bay of Matagorda, on the coast of Texas, have risen from 11 to 22 inches from 1845 to 1863. Along the coasts of New Jersey the sea has encroached within sixty years upon the sites of former habitations, and entire forests have been prostrated by the inundation.

In South America the indications of the elevation of the land in recent times are very remarkable. Darwin found heaps of modern shells on the Isle of Chiloe at the height of 347 feet. He ascertained that at Valparaiso, during the 17 years between 1817 and 1834, the ground had risen 10 feet 7 inches, or $7\frac{1}{2}$ inches a year. In front of Callao, on the island of San Lorenzo, at a height of 85 feet, he discovered in a bed of modern shells, roots of sea-weed, bones of birds, ears of Indian corn, plaited reeds, and some cotton-thread—relics of human industry almost exactly resembling those found in the graves of the ancient Peruvians, and presumably not more than some eight or ten centuries old. A yet more striking instance is mentioned in the article on "America" in the latest edition of the *Encyclopædia Britannica*, where it is stated that pottery has been found in a marine bed on the coast of South America at the height of 150 feet.

Lyell gives a very interesting account of a buried hut discovered in digging a canal, in 1819, near Stockholm, in Sweden, at the depth of 64 feet. It was covered by marine strata, containing the present dwarfish Baltic shells. He represents that it is impossible to explain the position of this hut without supposing a subsidence to the depth of 64 feet, and then a re-elevation to the same extent,—in all a movement of 128 feet. Now near this hut several vessels of antique form were also found, and an *iron anchor*.* Iron was not introduced into Sweden before the second or third century of our era, and, therefore, all of this movement of 128 feet occurred in about 1,600 years.†

On the west coast of Sweden, in 1862, Mr. Gwyn Jeffreys found recent shells, similar to those now living in the adjacent seas, at a height of 200 feet above the sea, and Lyell remarks that the date of this upheaval by no means reaches back to the Glacial Period.‡

On the coast of Norway the elevation is yet more surprising: marine shells, of species now existing a few degrees further north, have been observed here at a height of 600 feet above the sea—showing that the west coast of Norway has been raised 600 feet since the seas of this region acquired their present temperature§—600 feet, as I shall show presently, since the *Polished Stone Age*.

These facts remove, I think, any difficulty which the alleged changes in the coast lines and the interior lines of drainage might suggest as to the lapse of time since the palæolithic flood.

* Principles of Geol. II, p. 187; Archiv für Anthropologie, August 1875, s. 17.

† I am not ignorant that a recent attempt has been made to explain this by a land-slide.

‡ Principles, II, 192.

§ Ibid, vol. I, chap. vii; vol. II, chap. xxxi; Antiq. of Man, 4th edit.. pp. 63, 64.

4. *The Extinct Animals.*—I remarked at the outset that if we could fix the place of the mammoth in time, we could fix the epoch of man's appearance. It is not astonishing that the apprehension of the fact that man lived in England with the Hippopotamus and the Elephant, and that the British Lion was a veritable reality to the prehistoric Briton, should excite a feeling of a vague antiquity—an order of things entirely beyond the pale of such a chronology as our fathers were instructed in. Think of the remains of the reindeer being found within a few miles of London, and even as far south as the Pyrenees! and of the musk ox, now confined to the Arctic circle, ranging in the valley of the Dordogne within the human period, and that in association with such representatives of a warmer climate as the spotted hyæna of Southern Africa and the lion and hippopotamus! I do not wonder that the sober judgment of men like Lyell and Lubbock was unsettled, and that the whole world, as it were, has quietly acquiesced in the declaration that, while the exact limits cannot be fixed, the sojourn of man upon earth must have been *long*.

A moment's reflection ought, however, to raise the enquiry, Why should Europe constitute a continent apart by itself in the absence of the great pachyderms and the great carnivorous animals, which are found, in whole or in part, in Asia, Africa, and America? Why should the lion, the hyæna, the tiger, the rhinoceros, the elephant, not have crossed into Europe from Africa and Asia? In the early stage of the human period, it is agreed on all hands, these animals were found in Europe, and the impression that such a time is necessarily extremely remote, is simply an error, as I shall now proceed to show.

In the United States we are not unfamiliar with the extinction of wild animals that were common a few centuries ago. At the close of the last century the bison and the elk were found in the

Kanawha Valley, and the bison and the great moose-deer were both common in the valley of the Connecticut two centuries ago. It has been the same in India. Three centuries ago, as we learn from the public memoirs of the Mogul Emperor Baber, the rhinoceros, the wild buffalo, and the lion were found in the neighborhood of Benares, and the elephant abounded in the jungles around Chunar. The elephant has not been known in this region for a hundred years, but has been confined to the forests of the Himalâ and the ghâts of Malabar; while the rhinoceros is extirpated with not even a tradition of its former existence. The lion was common in the desert region northwest of Delhi in the memory of very old men now living, but "hardly a tradition," we are also told, remains to-day of this formidable animal."*

The Moa (*Dinornis giganteus*) of New Zealand has become very recently extinct, as has the *Æpiòrnis* of Madagascar, whose egg had a capacity of two gallons. These gigantic birds were twelve feet high.

The extinct fauna of the palæolithic period embraced the Urus (or *Bos primigenius*), the Aurochs (or European Bison, identical with the American bison), the Reindeer, the Great Irish Elk, the Cave-bear, Cave-lion, Cave-hyæna, Mammoth, Rhinoceros tichorinus, Hippopotamus major, &c. While it is universally conceded that man lived in Southern France with the reindeer, some doubt has been expressed as to the contemporaneity of man and the mammoth. But I shall not raise this question, and conceding the co-existence of all the animals named with man, I shall proceed now to show that most of them survived to the Historic Period, and all of them to a period not far removed from that.

The Urus and the Aurochs are both mentioned in the Niebe-

* Figuiet's Mammalia, pp. 143, 148, 150.

lungen Lied, and the traveller Bell mentions the former as existing in Poland in the 17th century, while the Emperor of Russia still preserves the Aurochs in the imperial forests of Lithuania. So much for two of the so-called extinct animals.

Great astonishment was excited when the bones of the Reindeer were found in the caves of the South of France, and great emphasis has been laid on this, in connection with the alleged change of climate, to show the great lapse of time which must have occurred since this denizen of the snowy North constituted the main support of man, where the consumptive now seeks those soft and delicate breezes which rustle amid the vines and almond-trees of Gascogne and Béarn. It had been overlooked that it had been recorded in the Orkneying Saga that the Norwegian jarls of the 12th century used to cross the seas from the Orkneys to hunt the reindeer in Scotland; and within a few years past the bones of this animal have been found near London, in the Walthamstow marshes, associated with spear-heads and knives of bronze. His remains have been found also in the ruined towers of Scotland, called "burghs" or "brochs," associated with those of the horse, ox, and sheep. They are found also in the Scotch peat, as well as in that of England* and Denmark, which belongs chronologically to the Polished Stone Age. And, lastly, I may add that it is now pretty well given up that both Cæsar and Sallust† refer to the reindeer as existing in their time in the Hercynian Forest. These facts settle this point conclusively so far as the reindeer is concerned. But you will observe that if we thus bring the reindeer down to recent times, we create the strongest presumption, without going further, that his contemporary in palæolithic times, the mammoth, cannot be

* Brit. Quar. Review, April 1874, p. 346.

† De Bel. Gal. VI, 26; *Fragm. incertæ sedis*, 18 Dietsch.; Excav. at the Kesslerloch, Merk, trans., p. 11. Mr. Boyd Dawkins admits that the reindeer lived in Germany in the time of Cæsar. Cave-Hunting, p. 79.

very far behind; we dispel the illusion that the era of these extinct animals in Europe is very remote.

The Great Irish Elk (*Megaceros hibernicus*) was one of the most superb animals among the gigantic fauna of this period. Its height was ten to eleven feet, and the breadth between the antlers ten to twelve feet. It has been represented by some to have been more ancient than the mammoth, but its remains also occur in the Irish and French peat, sometimes in association with objects of iron and bronze, and there is reason to believe that it is referred to in the "Book of Lismore" as hunted by the ancient Irish since the Christian era. It is indeed the opinion of Prof. Brandt that it survived in the marshes of Europe as late as the 14th century.*

The remains of the Cave-bear have been found in Neolithic caves in Italy, and M. Gervais now identifies it with the present brown bear of Europe. It attained a much greater size in ancient times, and this misled the palæontologists to refer it to a distinct species. The greater size of the ancient animals—the wild boars and the stags as well as the carnivores—is now a recognized fact, and is observable in the Neolithic as well as the Palæolithic period.

The Cave lion is now admitted to be identical in species with the Asiatic lion, and the Cave-hyæna is identified as the same with the spotted hyæna of Africa.† The lion, we know, existed in Thessaly in the time of Herodotus and Aristotle, and indeed as late as the beginning of our era.

All these animals, hastily assumed by naturalists to have

* For evidence on this point, see Dublin Quar. Jour. Sci., January 1865; Ibid, 1864, p. 154; Wilson's Prehist. Man, 2nd edit., p. 37; Matériaux, 1872; p. 534; Smithson. Rep. for 1865, p. 400. In one instance a leg of this animal was found in a bog in Ireland with a portion of the tendons, skin, and hair on it.

† Prof. Dawkins in Pop. Sci. Review, 1869, p. 153; Prehist. Times, p. 285.

been long extinct, were the contemporaries of the mammoth and the rhinoceros in Central and Western Europe; as we have remarked, the fact that they have existed in historic times creates the strongest probability for the recent existence of the great pachyderms, for which, however, the direct evidence, as I proceed to show, is very strong.

In the Book of Job some great pachyderm—either the elephant or the hippopotamus—is described as an object familiar to the readers of that primeval drama. The crocodile is also described. Now the crocodile has been ascertained within recent years to be still living in one of the rivers running through the ancient Samaria into the Mediterranean; and the leviathan and the behemoth of the sacred book were no doubt both well known in Palestine when they were selected for the purposes of illustration by this ancient writer. You will remember that, speaking of behemoth, he says, “he trusteth that he can draw up *Jordan* in his mouth:” why “*Jordan*,” if the animal was not found on the banks of that river?

Among the pottery found in the relic-beds at Troy by Dr. Schliemann there were various specimens moulded into the form of some animal, and some light is thrown on the allusion to behemoth in the book of Job by the fact that one of these vessels of pottery represented the hippopotamus. This was found in the bed above that referred to the Homeric Trojans, and as there is no trace of Egyptian influence at Troy, the discovery seems to show that the hippopotamus lived on the shores of the Hellespont about 1200 B. C. The bones of the same animal have been found in the bed of the river Chelif in Algeria, and although now confined to Central and Southern Africa, it is well known that in ancient (and even recent) times they frequented the mouth of the Nile.

So among the specimens of pottery at Mycenæ there was one

containing a delineation of the elephant, which implies the existence of this animal, about the time of the Trojan war, somewhere in the Mediterranean basin.

The hippopotamus is found nowhere in Asia at present, and (except in Siberiâ) has never existed there during the present geological period (the human epoch), as is generally believed; and Dr. Falconer, in his *Palæontological Memoirs*, mentions it as a curious fact that he was informed by the eminent Indian scholar and author of the *Sanskrit Encyclopedia*, Raja Radhakanta Derva, that the hippopotamus of India is referred to under different names of great antiquity, significant of "Water-Elephant," and "Living in the Water."* The fact, however, is not at all curious when our attention is called to the other fact that Alexander the Great refers to the animal as inhabiting the banks of the Indus in his letter to Aristotle, and that the naturalist of that expedition, Onesicritus, makes the same statement. †

The most extensive and remarkable of the palæolithic stations in Europe is that of Solutré, near Macon, in Eastern France. This was a sort of capital of the Cave-men—a tribal village—where are found the bones of 100,000 horses, and innumerable bones of the reindeer, with the bones of the mammoth, hyæna, and other palæolithic animals. The graves of "the artisans of the drift" are also found here—the extended skeletons of these early Mongoloid wanderers reposing at full length on the slabs which probably constituted originally the hearthstones of their cabins. ‡ I mention this station merely to call attention to the

* Ibid, vol. II, p. 573-80.

† See Buffon's *Nat. Hist.*, VII, 453, London, 1812.

‡ Mr. Boyd Dawkins is very loath to admit that palæolithic man practised burial, and is by no means candid in treating of Solutré. He tries to prove that the graves are Merovingian, although the whole body of French Archæologists, including M. de Mortillet, M. Cartailhac, Dr. Broca, M. Arcelin, &c., admit their palæolithic date. In 1873 the French Association in session at Lyons.

fact that the horns of the reindeer here are so well preserved that when placed under the saw they emit distinctly the odour of fresh bone.

You are aware that in Siberia the fossil ivory is so little decayed that it is the subject of a considerable commerce, and is regarded as hardly inferior to the Indian ivory. But the fresh condition of the bones and tusks of the mammoth in Eastern Russia and throughout Siberia north of 56° north latitude ceases to astonish us, when we encounter, as has been done in a number of instances, the almost perfectly preserved carcasses of the mammoth and rhinoceros in the frozen mud of the banks of the great rivers, with the flesh in such a condition that it is greedily devoured by the dogs and wolves. It is simply incredible that any geological antiquity can belong to this flesh and bones—there is no such example in palæontology.

The preservation of the carcass of the mammoth in Siberia, as Lyell has remarked, shows that the catastrophe which overtook him was consummated *suddenly*. The animal was caught immediately after death in the embraces of the frost before it had time to decompose—and the rigour of the climate has never abated since. Prior to this sudden refrigeration the climate of Siberia, as proved by the remains of vegetation and the absence of the reindeer during the sojourn of the mammoth, with the presence of the tiger and the spotted hyæna, was comparatively mild. The change in the climate corresponded probably with the close of the palæolithic age in Western Europe, and was due to the draining of the great Asiatic Mediterranean, of which the Caspian, the Aral, and the Black seas are the *residua*, and to the elevation of the land.

visited Solutré, and it was unanimously agreed that the burials belong to that age. Matériaux, 7th, 8th, and 9th livraisons, 1873.

It is especially worthy of note that the horse at Solutré seems to have been *domesticated*.

In America the mammoth and the mastodon roamed over the continent together, and the indications of their recent presence here—especially the mastodon—are such as to admit of no controversy—I say, of no controversy. Their remains are found all over the United States, and in Mexico, in the most recent and superficial deposits, the bones sometimes protruding above the surface of the shallow peat beds in which they were mired. “There can now be no doubt,” says Prof. Shaler (who does not believe in the recent apparition of man) “that a few thousand years ago these companion giants roamed through the forests and along the streams of the Mississippi Valley.” * * “Almost any swampy bit of ground,” he adds, “in Ohio or Kentucky, contains traces of the mammoth and mastodon.”* In several instances the undecayed remains of their last meal have been found in the stomach, and the bones of the mastodon, Dr. Foster remarks, have been recovered with so much of the gelatinous matter yet remaining in them, that “a nourishing soup might be extracted.”†

I will only add that among the animal mounds of Wisconsin, there is one near Racine, in Grant county, which is said to be a representation of an elephant, and goes under the name of “The Big Elephant Mound.”‡ A similar mound near the town of Muscoda, in the same state, and which was traditionally called the “Mastodon Mound,” is figured in a book on the Antiquities of America, published in 1858 by William Pidgeon, whose original home was in Frederick county in this State, and who examined the mounds of the Upper Mississippi Valley in 1840.

These facts—and I refer especially to the preservation of the carcasses of the mammoth and rhinoceros in Siberia, and to the occurrence of the remains of the mastodon and mammoth in

* *American Naturalist*, Vol. V, 606, 607.

† *Prehist. Races of U. S.*, p. 370.

‡ There is a cut of this mound in the *Smithsonian Report for 1872*, p. 416.

America ordinarily in the most superficial deposits—constitute positive testimony for the recent existence of these great animals, and remove perhaps the most impressive circumstance which seems to point to a remote antiquity for our race.

I have mentioned the evidence going to show the existence of the hippopotamus in the Troad in the 12th century B. C., and the delineation of the elephant at Mycenæ. It has been strangely overlooked in this connection that the "Voyage of Hanno," which refers to an expedition fitted out by the Carthaginian government about 500 B. C., speaks of "herds of elephants" as seen by this expedition on the northwest coast of Africa, and that Herodotus, Strabo, and Pliny all attest the existence of this animal in Mauretania—just across from Spain—before and at the beginning of the Christian era.* Remains of the African elephant have also been found in Spain, and in the Neolithic caves of Gibraltar Capt. Brome found the bones of the African lion, lynx, serval, leopard, and spotted hyæna.

From those eloquent records of the distant past, the slabs and obelisks of Assyria and Egypt, a startling testimony comes to us on this subject. From a representation on an Egyptian tomb at Qournah, of the time of Thothmes III,† and from the stele of Amenemheb, a military officer of the same reign, we learn that the elephant was among the tribute brought to the Egyptian monarch from Assyria about the period 1500 B. C.;‡ while from an inscription on the prism of Tiglath-pileser I, in the British Museum, we learn that that great Assyrian prince hunted the wild elephant in the valley of the Tigris about 1120 B. C.§ You see

* See Lenormant's *Ancient History of the East*, trans., vol. II, p. 263. Also Herod., Book IV, § 191; Pliny, *Nat. Hist.*, Book VIII, chap. 11, Strabo, Book XVII, chap. 3, §§ 4, 5, 7, 8.

† Birch's *Egypt*, p. 99; Smith's *Ancient Hist. of East*, p. 290.

‡ *Comptes Rendus de l'Academie des Inscriptions et Belles Lettres*, 1873, pp. 157, 165, 178.

§ Work last cited, p. 182.

the pertinence of this: if the African elephant ranged along the Straits of Gibraltar at the beginning of our era, and the Asiatic elephant was found not far from the Hellespont in the 12th century before Christ, is it improbable that a hardier species—the mammoth of the North—found its way into Europe at a date comparatively recent?

I have thus hurriedly passed in review the points usually relied on to prove the antiquity of man; the fact that the records of the most ancient nations, the Babylonians, the Egyptians, the Persians, the Chinese, the Hindoos, the Phœnicians, do not go back further than a few thousand years before our era, and the limited chronology of the Hebrew Scriptures, create the presumption that man is recent, and the burden of proof is with those who come forward to overthrow the belief established on these foundations. Those who defend the short chronology have only to show that the facts of Archæology and Geology are not inconsistent with the lower figures.

There is only one more point that I wish to touch; and this presents direct and positive proof from physical science for the recent appearance of man in Europe. The point to which I wish to call your attention is *the recent date of the Glacial Period*. I have not time to refer to the interesting observations of Prof. Edmund Andrews on the beaches of the Great North American Lakes, nor to those of Prof. N. H. Winchell on the Falls of St. Anthony, going to establish this fact: I desire to present a much simpler and much more concise argument—one which all can readily understand, and which seems to me to be conclusive on this subject. If we can fix the date of the Glacial Epoch, we can fix the antiquity of man's life in the world. Lyell contended as late as the tenth edition of his "Principles" that this great geological episode occurred 800,000 years ago; in the eleventh edition pub-

lished in 1872 he substituted 200,000. I am convinced that in a very few years geologists will bring it down as low as 10,000.

The remains of Palæolithic Man—the contemporary of the mammoth—have never been found north of latitude 54° in England, nor in Ireland, Scotland, Denmark, Norway, or Sweden. In these countries the earliest traces of man belong to the Neolithic or Polished Stone Age, nor, excepting a few cases in Scotland, and one or two in Ireland, have the remains of the mammoth been found in these countries. The reason for this is given by Lyell;* he refers it to the fact that when palæolithic man was living in the Somme Valley and the South of England, Scotland and Scandinavia were still covered by the ice-sheet—the Glacial Epoch still continued in those regions. So in the *Archiv für Anthropologie*,† we read; “Neither in Scandinavia nor in North Germany have we yet discovered the slightest trace of palæolithic man.” “Scandinavia and North Germany were then covered by the ice.”

When the ice retired, man advanced; but observe, he carried with him into Denmark and Scotland his polished stone implements—it was the Polished Stone Age when this advance took place. The ice-sheet, therefore, retired from Denmark and the North of England (perhaps North Germany) in the *Polished Stone Age*. If we can fix the date of the Polished Stone Age, we can fix the time when the Glacial Age terminated in these countries. Now Archæologists have approximately fixed the date of the Neolithic Age at from 3000 to 7000 years ago. In Denmark Prof. Worsaae places it at about 1000 B. C. It is the date of the older Lake-Dwellings, of the older Shell-Mounds, and of the Peat. My own opinion is that it was a great deal nearer 3000 years ago than 7000. I do not believe that it was earlier

* Principles of Geol., II, 360; Antiq. man, 4th edit., p. 295.

†August, 1875, Correspondenz-Blatt, s. 18.

than 2000 B. C. We have thus (approximately) the date of the Glacial Epoch fixed by Archæology—a brilliant achievement for this youngest of the sciences. And with the ascertainment of the date of the Glacial Age, we bring the great cycle of geological time, ere it springs backward into the Past, within the well-defined limits of Chronology, and fasten immovably the first link in human history to the striated rocks and ice-pressed clays of Scandinavia and Scotland.

NOTE ON EVOLUTION.

Beginning in the Lower Silurian the sub-class of bivalve shells known as Brachiopods (Lampshells) has continued to the present day. Of all the genera of animals now having living species only four or five, such as *Lingula* and *Discina*, commenced their existence in the Lower Silurian. These have survived through all the geologic ages, and with the exception of Dr. Dawson's *Eozoön Canadense* are among the earliest forms of life now known. They belong to the venerable and persistent tribe of Brachiopods. It occurred to Mr. Darwin that the history of these Brachiopods might throw some light on the theory of Evolution. Mr. Davidson, of Brighton, the friend of Mr. Darwin, has made the Brachiopods the subject of his life-study. In 1865 he received the Wollaston medal from the Geological Society, in 1868 the silver medal, in 1870 the gold medal of the Royal Society; and the title page of his later treatises is covered with the titles bestowed upon him by British and foreign societies. Mr. Darwin accordingly addressed a letter to Mr. Davidson remarking that "several really good judges had remarked to him how desirable it would be to exemplify and work out in detail with a single group of beings, the gradual changes which took place through the geological formations," requesting Mr. Davidson to make these observations with regard to the Brachiopods. After some hesitation Mr. Davidson complied with this request. In a lecture before the Brighton Natural History Society, published in the *Geological Magazine* for April, May, and June, 1877, he gave the result of his investigations. The judgment was adverse to the theory. I make the following extract:

"Darwin's tempting and beautiful theory of descent with modification bears a charm that appears to be almost irresistible, and I would be the last person to assert that it may not represent the actual mode of specific development. It is a far more exalted conception than the idea of constant independent creations; but we are stopped by a number of questions that seem to plunge the conception in a maze of inexplicable, nay, mysterious difficulties; nor has Darwin, as far

as I am aware, said how he supposes the first primordial form to have been introduced. The theory is at best, as far as we can at present perceive, with our imperfect state of knowledge, but half the truth, being well enough in many cases as between species and species; for it is evident that many so-termed species may be nothing more than modifications produced by descent. It applies, likewise, to accidental variations as between closely allied genera, yet there is much more than this, with respect to which the theory seems insufficient. The strange geological persistency of certain types, such as *Lingula*, *Discina*, *Nautilus*, etc., seems also to bar the at present thorough acceptance of such a theory of general descent with modification.

"We have no positive evidence of those modifications which the theory involves, for types appear on the whole to be permanent as long as they continue, and when a genus disappears there is no modification, that I can see, of any of the forms that continue beyond, as far as the Brachiopoda appear to be concerned, and why should a number of genera, such as *Lingula*, *Discina*, *Crania*, and *Rhynchonella*, have continued to be represented with the same characters and often with but small modification in shape during the entire sequence of geological strata? Why did they not offer modifications, or alter during those incalculable ages? Limiting myself to the Brachiopoda, let us see what further they will tell us upon this question. Taking the present state of our knowledge as a guide, but admitting at the same time that any day our conclusions and inductions may require to be modified by fresh discoveries, let us ascertain whether they reveal anything to support Darwinian ideas. We find that the larger number of genera made their first appearance during the Palaeozoic periods, and since they have been decreasing in number to the present period. We will leave out of question the species, for they vary so little that it is often very difficult to trace really good distinctive characters between them; it is different with the genera, as they are, or should be, founded on much greater and more permanent distinctions. Thus, for example, the family *Spiriferidae* includes genera which are all characterized by a calcified spiral lamina for the support of the brachial appendages; and however varied these may be, they always retain the distinctive characters of the group from their first appearance to their extinction. The Brachiopodist labours under the difficulties of not being able to determine what are the simplest, or which are the highest families into which either of the two great groups of his favourite class is divided; so far then he is unable to point out any evidence favouring progressive development in it. But, confining himself to species, he sees often before him great varietal changes, so much so as to make it difficult for him to define the species; and it leads him to the belief that such groups were not of independent origin, as was universally thought before Darwin published his great work on the 'Origin of Species.' But in this respect the Brachiopoda reveal nothing more than other groups of the organic kingdoms.

"Now although certain genera, such as *Terebratula*, *Rhynchonella*, *Crania*, and *Discina*, have enjoyed a very considerable geological existence, there are

genera, such as *Stringocephalus*, *Uncites*, *Porambonites*, *Koninckina*, and several others, which made their appearance very suddenly and without any warning; after a while they disappeared in a similar abrupt manner, having enjoyed a comparatively short existence. They are all possessed of such marked and distinctive internal characters that we cannot trace between them and associated or synchronous genera any evidence of their being either modifications of one or the other, or of being the result of descent with modification. Therefore, although far from denying the possibility or probability of the correctness of the Darwinian theory, I could not conscientiously affirm that the Brachiopoda, as far as I am at present acquainted with them, would be of much service in proving it. The subject is worthy of the continued and serious attention of every well-informed man of science. The sublime Creator of the Universe has bestowed on him a thinking mind; therefore all that can be discovered is legitimate. Science has this advantage, that it is continually on the advance, and is ever ready to correct its errors when fresh light or new discoveries make such necessary."

If Mr. Darwin is thus driven away from the animal kingdom by Mr. Davidson, a no less eminent specialist in the department of Botany gives a yet more emphatic verdict against him in that province of life: I refer to Dr. Carruthers, keeper of the botanical department of the British Museum. In an address before the Geologists' Association, of which he was then President, at the session of 1876-'77, he says :

"No doubt there is in the older Palæozoic rocks a great absence of any records of land life. But the evolution of the Vascular Cryptogams and the Phanerogams from the green seaweeds through the liverworts and mosses, if it took place, must have been carried on through a long succession of ages, and by an innumerable series of gradually advancing steps; and yet we find not a single trace either of the early water forms or of the later and still more numerous dry-land forms. The conditions that permitted the preservation of the fucoids in the Llandovery rocks at Malvern, and of similar cellular organisms elsewhere, were, at least, fitted to preserve some record of the necessarily rich floras, if they had existed, which, through immense ages, led by minute steps to the Conifer and Monocotyledon of these Palæozoic rocks.

"The complete absence of such forms, and the sudden and contemporaneous appearance of highly organized and widely separated groups, deprive the hypothesis of genetic evolution of any countenance from the plant record of these ancient rocks. The whole evidence is against evolution, and there is none in favour of it.

"The whole evidence supplied by fossil plants is, then, opposed to the hypothesis of genetic evolution, and especially the sudden and simultaneous appearance of the most highly organized plants at particular stages in the past

history of the globe, and the entire absence among fossil plants of any forms intermediate between existing classes or families. The facts of palæontological botany are opposed to evolution, but they testify to development, to progression from higher to lower types. The Cellular Algæ preceded the Vascular Cryptogams and the Gymnosperms of the newer Palæozoic rocks, and these were speedily followed by Monocotyledons, and, at a much later period, by Dicotyledons. But the earliest representatives of these various sections of the vegetable kingdom were not generalized forms, but as highly organized as recent forms, and in many cases more highly organized; and the divisions were as clearly bounded in their essential characters, and as decidedly separated from each other as they are at the present day. Development is not the property of the evolutionist; indeed, the Mosaic narrative—the oldest scheme of creation—which traces all nature to a supernatural Creator, represents the operations of that Creator as having been carried out in a series of developments, from the calling of matter into existence, through the various stages of its preparation for life, and on through various steps in the organic world, until man himself is reached. The real question is,—Does science give us any light as to *how* this development was accomplished? Is it possible, from the record of organic life preserved in the sedimentary deposits, to discover the method or agent through the action of which the new forms appeared on the globe? The rocks record the existence of the plants and animal forms; but as yet they have disclosed nothing whatever as to *how* these forms originated."

NOTE ON THE POST-GLACIAL FLOOD, p. 39.

The unceremonious manner in which the suggestion of a "Palæolithic Flood" is rejected by writers on this subject in England implies a want of proper attention to the facts of the case. American geologists, at least, take a very different view of the matter. Thus Dana remarks: "That the melting of the glacier should have ended in a great flood is evident from the common observation that, in cold latitudes, floods terminate ordinary snowy winters. * * * The fact that such a flood, vast beyond conception, was the final event in the history of the glacier, is manifest in the peculiar stratification of the flood-made deposits, and in the spread of the stratified Drift southward along the Mississippi Valley to the Gulf, as first made known by Hilgard. Only under the rapid contribution of immense amounts of sand and gravel, and of water from so unlimited a source, could such deposit have accumulated." *Manual*, 2nd edit., p. 553.

NOTE ON THE ABSENCE OF TRACES OF PALÆOLITHIC MAN IN THE NORTH OF EUROPE, pp. 52-54.

The argument for the recent date of the Glacial Epoch based on the absence of all traces of the palæolithic stone implements (and, with a few trifling exceptions, the absence of the palæolithic animals) in Denmark, Scandinavia, and Scotland was published in "The Recent Origin of Man" in 1875, and although there have been many notices and reviews of that work, no attempt has ever been made to reply to this point. I do not think it can be replied to. If there is any fallacy in the argument I should be pleased to have it pointed out. I have called attention to it several times since 1875, but to the present moment the advocates of the antiquity of man continue to pass it over in silence. I again call attention to it.

